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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,148	01/27/2004	Yoshihide Senzaki	A-70028-2/MSS/TJH (463035)	1972
32940	7590	11/28/2005	EXAMINER CAO, PHAT X	
DORSEY & WHITNEY LLP 555 CALIFORNIA STREET, SUITE 1000 SUITE 1000 SAN FRANCISCO, CA 94104			ART UNIT 2814	PAPER NUMBER

DATE MAILED: 11/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary	Application No.	Applicant(s)	
	10/766,148	SENZAKI, YOSHIHIDE	
	Examiner	Art Unit	
	Phat X. Cao	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 7, and 10-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Yu et al (US. 2002/0089023).

Regarding claim 1, Yu (Fig. 3) discloses a multilayer dielectric film comprising: a first layer 306 formed of a metal oxide material (par. [0041]) having a dielectric constant K and a thickness t; and a second layer 305 formed on the first layer 306, the second layer 305 is formed of a metal silicate material (i.e., Si-O-Sr) (par. (0039)) having a dielectric constant lower than the dielectric constant of the first layer 306 (par. [0018]) and a thickness of 1-10 monolayers (par. [0039]) which is smaller than the thickness of 5 to 100 nm (par. [0043], last 3 lines) of the first layer 306 (also see figure 3 for comparison).

Regarding claim 7, Yu's Fig. 3 further discloses that the second layer 305 is metal silicate having the formula of $M(x)Si(y)$, where M is a metal selected from Sr (par. (0022), last 3 lines).

Regarding claims 10-11 and 12, Yu (Fig. 3) discloses a multilayer dielectric film

comprising: a first layer 306 formed of a metal oxide material (par. [0041]) having a dielectric constant K and a thickness in the range of 30 to 80 angstroms (i.e., 5 to 100 nm) (par. [0043], last 3 lines), and a second layer 305 formed on the first layer 306, the second layer 305 is formed of a metal silicate material (i.e., Si-O-Sr) (par. [0039]) having a dielectric constant lower than the dielectric constant of the first layer 305 (par. [0018]) and a thickness in the range of one to two atomic layers (par. (0039)).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-5 and 7-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bai (US. 2001/0013629) in view of Yu et al (US. 2002/0089023).

Regarding claim 1, Bai (Fig. 1) discloses a multilayer dielectric film comprising: a first layer 120 formed of a metal oxide material (par. [0019]) having a dielectric constant K and thickness t; and a second layer 130 formed on the first layer 120, the second layer 130 formed on the first layer 120, the second layer 130 is formed of a metal oxide material (par. [0018]) having a dielectric constant of 30 which is lower than the dielectric constant of 300 of the first layer 120 (par. [0026]) and a thickness of 3 angstroms which is smaller than the thickness of 48 angstroms of the first layer 120 (see par. [0028], TABLE 1, example 6 for t(1) and t(2)).

Bai does not disclose that the metal oxide second layer 130 is a metal silicate.

However, Yu (Fig. 3) teaches the forming of a multilayer dielectric film comprising a first layer 306 formed of a metal oxide (par. [0041]) and a second layer 305 formed on the first layer 306, the second layer 305 is formed of a metal silicate material (i.e., Si-O-Sr) (par. [0039]) and has a thickness smaller than the thickness of the first layer 305. Accordingly, it would have been obvious to form the second layer 130 of Bai with either metal oxide or metal silicate material because as taught by Yu, such materials would perform equivalence in functions as a template layer which is used to successfully grow the first layer of the high dielectric contact metal oxide (par. [0022]).

Regarding claims 3-5, Bai's Fig. 1 further discloses that the second layer 130 is comprised of a material having a dielectric constant in a range of 5 to 100 (i.e., 30) (par. [0026]), the first layer 120 is a metal oxide having the formula of $M(x)O(y)$ and including more than one metal element (i.e., $BaSrTiO(3)$) (par. [0019]).

Regarding claim 2, Bai further discloses that the first layer 120 is comprised of a material having a dielectric constant of 300 (par. [0026]). Therefore, it would have been obvious to form the first layer 120 with a material having a dielectric constant of 300 (as suggested by Bai) or 200 (as claimed) because such high dielectric constant materials would provide the same results of being stable in contact with the desired gate material, as taught by Bai (par. [0015]).

Regarding claims 7-8, Yu's Fig. 3 also teaches that the template second layer 305 is a metal silicate having the formula of $M_9xSiO(y)$ (par. [0039]) and including more than one metal element (Sr, Ba) (par. [0047]).

Regarding claim 9, Yu also teaches that the template second layer 305 may include silicon oxygen, an element suitable to successfully grow first layer 306. For example, if the first layer 306 is formed of SrTiON, a suitable template layer 305 may comprise Si-O-Sr. Therefore, it would have been obvious to select the metal silicate second layer 305 from the group consisting of Zr-Si-O and Hf-Si-O because Zr and Hf are the materials which are used for the first layer 306 (par. [0041]) and are elements suitable to successfully grow the first layer 306.

Regarding claims 10-12, Bai's Fig. 1 further discloses that the first layer 120 has a thickness in a range of about 30 to 80 angstroms (i.e., $t(2) = 48$), and a second layer 130 has a thickness of $t(1) = 3$ angstroms (par. (0028), TABLE 1, example 6).

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bai and Yu et al as applied to claim 4 above, and further in view of Ma et al (US. 6,407,435).

Neither Bai nor Yu disclose the first layer of metal oxide is selected from the group consisting of ZrO(2) or HfO(2).

However, Ma (Fig. 2) teaches the forming of a multilayer dielectric film comprising a first layer 140 of high dielectric constant metal oxide formed on a second layer 130 of lower dielectric constant metal oxide, the first layer 140 of high dielectric constant metal oxide is selected from the group consisting of ZrO(2), HfO(2) and BaSrTiO(3) (column 4, lines 36-41). Accordingly, it would have been obvious to form the first layer 120 of Bai with either BaSrTiO(3) (as suggested by Bai) or ZrO(2) because as taught by Ma, such materials would perform equivalence in functions as a high dielectric constant material (column 4, lines 1-8).

Response to Arguments

5. Applicant argues that the first layer 306 of Yu is not “formed of a metal oxide material”, it is a layer of metal oxide-nitride material.

This argument is not persuasive. It should be noted that claims in a pending application should be given their broadest reasonable interpretation. *In re Pearson*, 494 F. 2d 1399, 181 USPQ 641 (CCPA 1974). Therefore, the broadly claim language of “formed of a metal oxide material” does not limit only to a pure metal oxide material as asserted by Applicant, but rather, it does include a layer of metal formed of a metal oxide alloy. Thus, “a first layer formed of a metal oxide material” is met by the first layer 306 of Yu formed of a metal oxide alloy material of metal oxide-nitride.

Applicant also argues that it would not be obvious to combine Bai with Yu by substituting the second layer 130 of metal oxide with metal silicate because Yu does not suggest that such materials would perform equivalence in functions as a template layer for growing the first layer of the metal oxide as asserted by the examiner.

This argument is not persuasive because in an embodiment shown in Fig. 1, Yu clearly teaches that the second layer 105 made of metal silicate (i.e., Sr-Si-O) is used as a template layer for growing the first layer 102 made of metal oxide (i.e., SrTiO(3)) (see par. [0022]). And in the other embodiment shown in Fig. 4, Yu also clearly teaches that the second layer 405 made of metal oxide (i.e., Sr-Ba-O) is also used as a template layer (par. [0047]) for growing the first layer 406 made of metal oxide (i.e., SrTiO(3)) (par. [0048]). Therefore, it would have been obvious to substitute the second layer 130 of metal oxide with metal silicate because Yu clearly suggests that the using of a metal

oxide (Fig. 4) or a metal silicate (Fig. 1) for a second layer would perform equivalence in functions as a template layer for growing the first layer of a metal oxide.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is 571-272-1703. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC
November 22, 2005


PHAT X. CAO
PRIMARY EXAMINER